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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,436	07/24/2003	Klavs F. Jensen	0492611-0477	9621
24280	7590	11/08/2005	EXAMINER	
CHOATE, HALL & STEWART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110			LEUNG, JENNIFER A	
			ART UNIT	PAPER NUMBER
			1764	

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/626,436		JENSEN ET AL.	
	Examiner		Art Unit	
	Jennifer A. Leung		1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-115 is/are pending in the application.
- 4a) Of the above claim(s) 38-115 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-115 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 38-115 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Election was made **without** traverse in the reply filed on October 28, 2005.

Claim Objections

2. Claims 3 and 14 are objected to because of the following informalities:

In claim 3, line 2: “emersed” should be changed to --immersed--.

In claim 14, line 1: “are” should be changed to --is--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, “said at least one micromixing block *channel*” (lines 5-6) lacks proper positive antecedent basis.

Regarding claim 4, “the *ultrasonification* means” (line 1) lacks proper positive antecedent basis. Also, it is unclear as to whether applicant intended to recite an “*ultrasonification* transducer” or an “*ultrasonication* transducer” in line 2.

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Regarding claim 15, the language of the claim is directed to a method limitation which renders the claim vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by “said microreactor employs solution-based sol-gel processing”. The type of processing to be conducted using the apparatus is considered a method limitation and not an element of the apparatus.

Regarding claims 16 and 17, the language of the claims is directed to method limitations which render the claims vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “a first reactant stream... comprises alkoxide in alcohol” and “a second reactant stream... comprises water in alcohol”. The compositions of the first and second reactant streams are considered method limitations that provide no further patentable weight to the apparatus claims.

Regarding claim 18, the language of the claim is directed to a method limitation which renders the claim vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “said reactant streams have flow rates in the range of between about 0.1 $\mu\text{L}/\text{min.}$ and about 10 $\mu\text{L}/\text{min.}$ ” The flow rates are considered method limitations that provide no further patentable weight to apparatus claims.

Regarding claims 19-26, it is unclear as to the structural limitation applicant is attempting to recite because the particle type of colloidal nanoparticles to be synthesized are not considered an element of the apparatus.

Regarding claim 27-29, the language of the claims is directed to method limitations which render the claims vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “said colloidal nanoparticles have monodisperse size

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distribution” or “... polydisperse size distribution” or “precisely defined polydisperse size distribution.” The particular distribution of the colloidal nanoparticles provides no further patentable weight to the claims because the colloidal nanoparticles are not considered an element of the apparatus.

Regarding claim 30, the language of the claim is directed to a method limitation which renders the claim vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “said colloidal nanoparticles are charged.” The charge on the colloidal nanoparticles provides no further patentable weight to the claim because the colloidal nanoparticles are not considered an element of the apparatus.

Regarding claims 34 and 35, the language of the claims is directed to method limitations which render the claims vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “said quench fluid is an inert solvent” and “said quench fluid is alcohol”. The particular composition of the quench fluid provides no further patentable weight to the claims because the quench fluid is not considered an element of the apparatus.

Regarding claim 36, “said reacting fluids” (line 2) lacks proper positive antecedent basis. Therefore, “the flow rate of said reacting fluids” lacks proper positive antecedent basis. In addition, the language of the claim is directed to a method limitation which renders the claim vague and indefinite, as it is unclear as to what structural elements the applicants are attempting to recite by, “said quench fluid is introduced into said microreactor at a flow rate equal to or greater than the flow rate of said reacting fluids.” The flow rates of the quench fluid and the reacting fluids are considered method limitations that provide no further patentable weight to the apparatus claim.

Regarding claim 37, it is unclear as to the structural limitation applicant is attempting to recite by, “the introduction of said quench fluid into the microreactor stops the colloidal nanoparticle growth” because the colloidal nanoparticle growth is considered a process limitation and not an element of the apparatus.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 7, 11-30 and 33-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Barbera-Guillem et al. (US 6,179,912).

Regarding claims 1 and 7, Barbera-Guillem (FIG. 1, 2; column 5, line 23 to column 6, line 64; column 8, line 24 to column 15, line 63) discloses an apparatus comprising:

at least one inlet channel (i.e., feed tube paths **5a**, **5b**, **5c**); at least one micromixing block (i.e., first reactor **12**, with mixing “Y” connection) positioned downstream from the inlet channel; an aging section (i.e., second reactor **14**, shown with a coiled flow path of variable length) positioned downstream from the micromixing block; and at least one outlet channel (i.e., growth termination path **16** with outlet path **18**) positioned downstream from the aging section.

Regarding claims 11-13, a first reactant stream **A** (from source **1c**), a second reactant stream **B** (from source **1a**), and a third reactant stream **C** (from source **1b**) are introduced into the apparatus at a first inlet channel **5c**, a second inlet channel **5a**, and a third inlet channel **5b**, respectively (see FIG. 1, 2).

Regarding claim 14, more than one reactant stream (i.e., reactants **B** and **C**, from sources **1a** and **1b**, respectively) is introduced through one inlet channel (i.e., mixing path **7**). (FIG. 1, 2).

Regarding claims 15-18, the apparatus of Barbera-Guillem structurally meets the claims because the first reactant stream and the second reactant stream are not considered elements of the apparatus, and the type of processing conducted in the apparatus is merely intended use. In addition, the flow rate of the reactant stream is a process limitation that provides no further structure to apparatus claims.

Regarding claims 19-30, the apparatus of Barbera-Guillem structurally meets the claims because the nanoparticles to be synthesized by the apparatus are not considered elements of the apparatus. Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, inclusion of a material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963).

Regarding claims 33-37, the crystal growth is disclosed as being “halted” in the growth termination path 16 (column 13, line 50 to column 14, line 49).

“As known to those skilled in the art, and depending on the nature of the desired semiconductor nanocrystals produced, growth termination may be achieved by one or more processes which include... the addition of a crystal growth terminator, to the sol containing the semiconductor nanocrystals, in an effective amount for halting further crystalline growth after a desired size is obtained.”

Thus, the apparatus must inherently comprise a quench fluid inlet port to enable the disclosed introduction of a quench fluid (i.e., the crystal growth terminator) into the apparatus. Note that

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the particular quench fluid composition, however, provides no further patentable weight to the claims because the quench fluid is not considered an element of the apparatus. Similarly, the recited flow rate of quench fluid relative to the reacting fluids provides not further patentable weight to the claims because the quench fluid, as well as the reacting fluids, are not considered elements of the apparatus.

Instant claims 1, 7, 11-30 and 33-37 structurally read on the apparatus of Barbera-Guillem et al.

5. Claims 1, 7-13, 15-30 and 33-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Zehnder et al. (US 2002/0083888).

Regarding claims 1, 7, 11 and 12, Zehnder et al. (sections 0032], [0033]; FIG. 2) discloses an apparatus comprising:

at least one inlet channel (i.e., for supplying a first reagent **42** , via pump **44** and preheater **46** of a first inlet channel; and also for supplying a second reagent **43**, via pump **45** and preheater **47** of a second inlet channel); at least one micromixing block (i.e., mixing chamber **48**) positioned downstream from the inlet channel; an aging section comprising at least one aging channel (i.e., heated reactor **41**) positioned downstream from the micromixing block **48**; and at least one outlet channel (i.e., for a PRODUCT stream, exiting processing unit **67**) positioned downstream from the aging section.

Regarding claim 8, Zehnder et al. (page 3, section [0023]) discloses that, "In most application, it is contemplated that the reaction tube will be from about 3 cm to about 300 cm in length, preferably from about 10 cm to about 100 cm in length." Thus, the length of said aging channel in reactor **41** is within the claimed range of between about 1 cm and about 100 cm.

Regarding claims 9 and 10, Zehnder et al. (page 3, section [0021]) discloses that, "... successful results will be obtained with a reaction tube having an internal diameter of about 1.0 mm or less, and preferably within the range of about 0.1 mm to about 1.0 mm, and most preferably within the range of from about 0.25 mm to about 0.8 mm." Thus, the width of the at least one aging channel in reactor 41 is within the claimed range of between about 10 μm and about 5000 μm , and the depth of the at least one aging channel in reactor 41 is within the claimed range of between about 10 μm and 2000 μm .

Regarding claim 13, a third reactant stream may be introduced at a third inlet channel (i.e., for supply of a coating agent 54, via pump 55 in a third inlet channel; FIG. 2).

Regarding claims 15-18, the apparatus of Zehnder et al. structurally meets the claims because the first reactant stream and the second reactant stream are not considered elements of the apparatus, and the type of processing conducted in the apparatus is merely intended use. In addition, the flow rate of the reactant stream is a process limitation that provides no further structure to apparatus claims.

Regarding claims 19-30, the apparatus of Zehnder et al. structurally meets the claims because the nanoparticles to be synthesized by the apparatus are not considered elements of the apparatus. Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim. *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, inclusion of a material or article worked upon by a structure being claimed does not impart patentability to the claims. *In re Young*, 75 F.2d 966, 25 USPQ 69 (CCPA 1935); *In re Otto*, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963).

Regarding claims 33-37, a quench fluid inlet port (i.e., diluent 49 supplied by metering

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pump 50 to mixing chamber 51; or diluent 62 supplied by metering pump 63 to mixing chamber 64; FIG. 2) is downstream from the aging section and upstream from the at least one outlet channel (i.e., for the PRODUCT stream leaving the processing unit 67; FIG. 2). Note that the particular quench fluid composition, however, provides no further patentable weight to the claims because the quench fluid is not considered an element of the apparatus. Similarly, the recited flow rate of quench fluid relative to the reacting fluids provides not further patentable weight to the claims because the quench fluid, as well as the reacting fluids, are not considered elements of the apparatus.

Instant claims 1, 7-13, 15-30 and 33-37 structurally read on the apparatus of Zehnder.

6. Claims 1, 7, 11 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Masel et al. (US 6,193,501).

Masel et al. (FIG. 2; column 3, line 4 to column 7, line 20) discloses an apparatus comprising: at least one inlet channel (i.e., a first inlet channel for oxidizer 20 and a second inlet channel for fuel 22); at least one micromixing block (i.e., mixer nozzle 26) positioned downstream from the inlet channel 20,22; an aging section comprising at least one aging channel (i.e., serpentine channels of the combustion chamber, defined by walls 18; column 6, lines 27-41) positioned downstream from the micromixing block 26; and at least one outlet channel (i.e., to exhaust nozzle 28) positioned downstream from the aging section.

Instant claims 1, 7, 11 and 12 structurally read on the apparatus of Masel et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barbera-Guillem et al. (US 6,179,912) OR Zehnder et al. (US 2002/0083888) in view of Yasuda et al. (US 6,244,738).

Barbera-Guillem et al. and Zehnder et al. are each respectively silent as to the apparatus comprising an ultrasonication means.

Yasuda et al. (FIG. 1, 2; column 1, line 5 to column 3, line 36) teaches an apparatus suitable for mixing a fluid in which particles may be incorporated, wherein the apparatus comprises a mixing channel 20 having a cross sectional area that is extremely smaller than its length for mixing a first fluid supplied by a first inlet channel 21 and a second fluid supplied by a second inlet channel 22. The apparatus further comprises an ultrasonication means (i.e., an ultrasonication transducer/vibrator 31, 32, 33 attached to the apparatus).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide an ultrasonication means to the apparatus of Barbera-Guillem et al. OR the apparatus of Zehnder et al., on the basis of suitability for the intended use thereof, because the

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ultrasonication means allows for the fluids to be further mixed as they flow through the channel without any rise in flow resistance. Additionally, remaining drops caused by unevenness of the channels is not produced. (see column 2, line 62 to column 3, line 2).

8. Claims 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Barbera-Guillem et al. (US 6,179,912) OR Zehnder et al. (US 2002/0083888) in view of Yasuda et al. (US 6,244,738), as applied to claim 2 above, and further in view of Chandler et al. (US 6,506,584).

The collective teaching of Barbera-Guillem et al. and Yasuda et al. and the collective teaching of Zehnder et al. and Yasuda et al. are each respectively silent as to the ultrasonication means comprising an ultrasonication bath into which the apparatus or a portion thereof is immersed. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute another known, suitable type of ultrasonication means (such as an ultrasonication bath) for the ultrasonication means in the modified apparatus of Barbera-Guillem et al. OR the modified apparatus of Zehnder et al., on the basis of suitability for the intended use and absent showing any unexpected results thereof, because such ultrasonication means are conventionally known in the art, and the substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958). Chandler et al. (column 5, lines 4-26; column 7, line 24 to column 8, line 18) further illustrates that both types of ultrasonication means (i.e., an ultrasonication transducer or an ultrasonication bath) are known, structural equivalents. FIG. 2 shows an apparatus 100 comprising a reaction tube 202 defining a channel for fluid flow path 108, wherein the apparatus comprises an ultrasonication transducer 104 attached to the apparatus. As an

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alternative embodiment, FIG. 4 shows the reaction tube 202 being partially immersed in an ultrasonication bath 308.

9. Claims 5, 6, 8-10, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barbera-Guillem et al. (US 6,179,912) in view of Zehnder et al. (US 2002/0083888).

Barbera-Guillem (column 8, line 66 to column 9, line 14) discloses,

“... the size or fluid capacity of the system, and of the individual parts of which it is comprised, may vary depending on factors including, but not limited to, the desired throughput of starting materials and coordinating solvent, the desired output of the system... and the nature of the starting materials. It will be appreciated by those skilled in the art that the system and its individual parts may be varied in dimension (e.g., capacity, overall width, overall length, diameter, and the like) in producing a system suitable for the intended function according to the present invention.”

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select appropriate dimensions, such as the instantly recited widths, depths and lengths, for the respective elements of the apparatus of Barbera-Guillem, on the basis of suitability for the intended use and absent showing any unexpected results thereof, because changes in size would merely involve routine skill in the art, as disclosed above. The Zehnder et al. reference is further provided to illustrate that channels having the claimed range of dimensions are known to be suitable for synthesizing nanoparticles (see page 3, sections [0021] and [0023]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
November 4, 2005 *JAL*

Hien Tran
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PRIMARY EXAMINER